FACTSHEET

ANIMAL SCIENCE

ORDER NO. 06-071

AUGUST 2006

AGDEX 460/20

Ontario Ministry of Agriculture, Food and Rural Affairs

THE USE OF INSECTICIDE-IMPREGNATED CATTLE EAR TAGS ON THE HALTERS OF HORSES

B. Wright, G. Ogilvie and S. MacNeil

Insecticide-impregnated ear tags were first registered in Canada in the late 1970s and are used on cattle for the control of face flies and horn flies. For cattle, very small amounts of active ingredient (less than 2 g) are released onto the animal in a season. The insecticide is transferred onto the back and flanks through natural grooming behaviour as a result of the fat solubility of the insecticide and its ability to migrate through the lanolin in the hair.

From time to time, horse owners have assumed that these ear tags, when placed on the halters of their horses, would also protect horses from nuisance flies. However, there are only a few studies researching the use of these ear tags in horses. The following summarizes the use of ear tags and its limitations, based primarily on research in cattle and on a small amount of research in horses.

FLIES THAT ANTAGONIZE HORSES

The main flies that bother horses and the body areas they prefer are:

Common Name	Latin Name	Preferred Body Area
House flies	*Musca domestica*	eyes, nostrils, anus
Stable flies	*Stomoxys calcitrans*	legs and flanks
Face flies	*Musca autumnalis*	face
Horn flies	*Haematobia irritans*	belly, flanks
Black flies	*Simulium spp.*	ears, belly
Horse and deer flies	*Tabanus spp.*	neck, belly
Bot flies	*Gasterophilus spp.*	forelegs and lips

The **house fly** and **stable fly** are considered filth flies. They breed in decaying organic material, including wet decaying hay, urine-soaked bedding and manure. Old decaying hay, from hay fed on the ground or from round bales, is an ideal breeding ground. House flies have sponge-like mouth parts and feed on secretions from the eyes, nostrils and anus [1]. Stable flies have piercing, sucking mouth parts and feed on the lower legs of animals. The stable fly feeds intermittently and may bite several horses before taking a blood meal [2]. One study with horses did demonstrate the efficacy of insecticide-impregnated ear tags against stable flies [3]. However, they are best controlled by cleanliness in the barn, using knock-down insecticides in the barn and wipe-on or spray insecticides on the horse.

Only the **face fly** and **horn fly** spend any significant amount of time on or around the horse. **Horn flies** like to congregate on the belly, sides and flank of horses, where they suck blood and may cause severe skin irritation and lack of hair [1, 4]. The horn fly prefers cattle but will feed on horses pastured with or near cattle [5]. Horn flies spend most of their time on the animal, only leaving the animal to lay their eggs in undisturbed, fresh cattle feces [2, 6, 7]. The horn fly may deposit its eggs in horse manure, but larval development is not completed [5]. Horn flies have a good chance of receiving a lethal dose of insecticide from ear tags when the horse's grooming habits spread the insecticide to the affected areas and if the horse owner does not bath the horse frequently. Wipe-on or spray-on insecticides also work well.

Face flies feed upon the mucous secretions around the eyes, nose and lips without piercing the skin. They will also feed on fresh wounds or saliva deposits on the shoulders, neck, brisket and legs. Face flies have been implicated in the transmission of conjunctivitis (pinkeye) [8]. Adult face flies will feed on several kinds of large mammals. They only lay their eggs in cow manure prior to crust formations [8]. Treatments for horses consist primarily of sponging, wiping or misting insecticides on the horse's face. Face flies spend very little time on the animal and, therefore, may not pick up a lethal dose from ear tags. The sub-lethal exposure to insecticides can in turn lead to the development of resistance [6, 9]. Some studies have indicated good face fly reduction on cattle treated with ear tags [6].

Black flies, horse flies and deer flies are interested in obtaining a blood meal. Their life cycle includes development of larvae in aquatic or semi-aquatic areas. They do not maintain continual contact with the horse, and, therefore, the ear tags are ineffective. Ear tags are designed to work by slowly releasing the insecticide onto the animal over time. Horse and deer flies are generally larger than house flies and are vicious biters. Their mouth parts work somewhat like a scissors. They cut a hole in the skin and feed from the wound. There is generally only one generation per year, but there are three or four species that have different life cycles, so horse and deer fly attacks on horses may occur during most of the summer. Fortunately, there are only a few of these flies per animal at any one time. Control of horse and deer flies in their aquatic breeding areas is impractical. Only daily application of insecticides or repellents provides some reduction in numbers.

Bot flies are merely interested in laying their eggs on the hair of a horse. They are bee-like and are a nuisance, but the adult causes no harm. It is the larvae in the stomach that are the problem.

TYPES OF INSECTICIDE-IMPREGNATED EAR TAGS

There are seven different brands of ear tags currently marketed in Canada. They belong to two main types: the organophosphates and the pyrethroids. In addition, one product (Eliminator®) contains a combination of organophosphates and synthetic pyrethroids. The ear tags are slow release, so the chemical will eventually coat the halter and much of the animal through grooming. The product labels for the six different brands of ear tags recommend that you wear chemical-resistant gloves for protection when applying and handling the tags [10]. The ear tags attached to the halters of horses could provide a chemical-exposure problem for human handlers, if they are grooming and riding their horses regularly.

ORGANOPHOSPHATES

The organophosphates include tetrachlorvinphos (Ectogard™) and diazinon (Protector® and Optimizer®). These products kill resistant and non-resistant flies but, for the flies to obtain a lethal dose, a contact time of 1–2 hr is needed.

Ear tags impregnated with tetrachlorvinphos, Ectogard™, indicate that the ear tags are to be used for the control of horn flies and the reduction of face flies in dairy and beef cattle [10].

Resistance in the fly population to organophosphate insecticides does exist in Ontario, although there are geographical pockets of susceptible flies [6]. Currently there have been no studies or trials conducted that have investigated the efficacy and toxicity of using tetrachlorvinphos-impregnated ear tags attached to the halters of horses. Tetrachlorvinphos, a cholinesterase inhibitor, has been used as a feed-through (oral) larvicide in horses, as well as cattle. There have been some adverse health effects from using the oral larvicide [11, 12]. Tetrachlorvinphos is registered for use in horses in the U.S. but not in Canada [13]. Any use of tetrachlorvinphos in horses in Canada would be considered off-label use. The United States Environmental Protection Agency (USEPA) and the Pest Management Regulatory Agency of Canada (PMRA) both consider tetrachlorvinphos to be a possible human carcinogen and recommend the wearing of chemical-resistant, rubber or plastic gloves and single layer clothing covering exposed skin while applying and handling tetrachlorvinphos-impregnated ear tags [13, 14]. The combined use of tetrachlorvinphos-impregnated ear tags and tetrachlorvinphos-containing oral larvicide or other organophosphate products (including some horse dewormers) could result in organophosphate toxicity in animals.

The label for the Ectogard™ Cattle Insecticide Ear Tag indicates that no withdrawal period between treatment and slaughter of cattle is necessary [10]. No data is available for horses. Due to the lack of supporting scientific data, Engage Animal Health Corporation has indicated that they cannot recommend their Ectogard™ Cattle Insecticide Ear Tags for use with horses [15].

SYNTHETIC PYRETHROIDS (SECOND AND FOURTH GENERATION)

The available synthetic-pyrethroid-based insecticides paralyze and knock down flies immediately. The products currently available in Canada include:

- second generation permethrin (Atroban® and Gardstar®)
- fourth generation lambda-cyhalothrin (Saber™), which are five times more biologically active and have a longer residual activity

Results from a study conducted in the summers of 1997 and 1998 indicate that there is resistance in the horn-fly population to both organophosphate and pyrethroid insecticides. The study found that the insecticide-impregnated ear tags failed to significantly reduce the numbers of horn flies on cattle [9]. One study using horses found that permethrin-impregnated ear tags did not provide adequate control of flies [4]. It is believed that the arthropod defensive behaviour of horses is substantially different than that of cattle for which the ear tags were designed and, therefore, the ear tags would be less effective [4].

TABLE 1. Fly-Control Comparison of Insecticide-Impregnated Ear Tags When Used With Cattle

Product	Manufacturer	Active Ingredient	Insecticide Class	Effectiveness on Flies Affecting Cattle
Atroban®	Engage	10% permethrin	Second-generation synthetic pyrethroid	Good effectiveness against synthetic pyrethroid–susceptible horn flies. Suppression of face flies with two tags.
Gardstar®	Y-Tex	10% permethrin		
Bovaid® (Discontinued)	Vétoquinol	8% fenvalerate		
Eliminator®	Vétoquinol	11% diazinon 6% cypermethrin	Combination of organophosphate and synthetic pyrethroid	Moderate to good activity against susceptible and resistant flies. Suppression of face flies with two tags.
Optimizer®	Y-Tex	20% diazinon	Organophosphate	Moderate activity against pyrethroid-susceptible and -resistant flies. Suppression of face flies with two tags.
Protector®	Vétoquinol	20% diazinon		
Ectogard™	Engage	14% tetrachlorvinphos		
Saber™	Engage	10% lambda-cyhalothrin	Fourth-generation synthetic pyrethroid	Excellent longer activity against synthetic pyrethroid–susceptible flies. Controls face flies with only one tag.

COMMENTS

Second generation synthetic pyrethroids are older and have much better activity than organophosphates because of their fat solubility and ability to migrate through the lanolin and fur of the cattle. However, resistance to synthetic pyrethroids has developed in Western Canada, where an organophosphate tag should be recommended for use on cattle.

Fourth-generation pyrethroid tags are five times more biologically active and have much better face-fly control. They still may not control synthetic pyrethroid–resistant horn flies.

RECOMMENDATIONS

The attachment of cattle insecticide ear tags to the halters of horses, while occasionally done, is not generally recommended because:

- Use of cattle ear tags on horses is an off-label use.
- There are potential human health concerns from contact with the organophosphate ear tags.
- In some areas, fly populations are known to be resistant to pyrethroid and organophosphate insecticides. If horse handlers choose to use ear tags, those impregnated with a combination of insecticides (diazinon and cypermethrin) could be beneficial [6]. The synergistic action of the combined insecticides may prove more effective in areas where resistance occurs [6].
- There are a number of differences between horses and cattle, e.g., fly/insect (arthropod) defensive behaviour, grooming behaviour and lanolin content in the skin/hair, which lessen the effectiveness of these products when used on horses.
- From the research in cattle, insecticides should be rotated when used on a yearly basis, and the impregnated ear tags should be removed at the end of the fly season to prevent resistance from developing.

The use of alternative methods of application may prolong the usefulness of pyrethroid and organophosphate insecticides for the control of horn flies in areas where resistance has not yet occurred [9].

REFERENCES

1. Campbell JB. Horse insect control guide. Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln Extension. http://www.ianrpubs.unl.edu/epublic/pages/publicationD.jsp?publicationId=498

2. Perris EE. Parasitic dermatoses that cause pruritus in horses. Vet Clin North Am Equine Pract (1995) 11:11–28.

3. Parashar BD, Gupta GP, Rao KM. Control of haematophagous flies on equines with permethrin-impregnated ear tags. Med Vet Entomol (1989) 3:137–40.

4. Jones CJ, Patterson RS, Koehler PG. Horn fly (Diptera: Muscidae) control on horses using pyrethroid tags and tail tapes. Fla Entomol (1988) 71:205–07.

5. Lane F, Lane C. Parasitic skin diseases. Vet Clin North Am Equine Pract (1986) 2:403–37.

6. Butler SM [PhD Candidate, Department of Entomology, University of California Riverside]. Personal communication, June 2006. Riverside, California, US.

7. Lane F, Lane C. Dipteran parasites of horses. Equine Pract (1988) 10:21–38.

8. Williams RE. The face fly. The Department of Entomology, Purdue University http://www.entm.purdue.edu/Entomology/ext/targets/e-series/EseriesPDF/E-206.pdf

9. Butler SM. Horn fly, *Haematobia irritans,* resistance in Ontario to pyrethroid and organophosphorous insecticides impregnated in cattle ear tags. M.Sc. thesis. Guelph, Ontario: University of Guelph, 1999.

10. North American Compendiums Limited. Compendium of veterinary products. 9th ed. Hensall, Ontario: North American Compendiums Limited, 2005:261, 297, 399, 405, 638–39, 689.

11. Madigan JE, Valdez S, Pushner B, Pusterla JB, Leutenegger CM. The effects of tetrachlorvinphos fly control (Equitrol) on physical parameters, blood cholinesterase levels, blood cytokine profiles, serum thyroid values and selected behavioural stimuli in horses. Research abstract, personal communication, June 2006.

12. Standardbred Canada, Insider News — Feed Additive Lawsuit, April 8, 2004. http://www.standardbredcanada.ca/news/iss0404/equitrol0408.html

13. Pest Management Regulatory Agency. Re-evaluation of tetrachlorvinphos — proposed acceptability for continuing registration. Health Canada, September 2003. PACR2003-09. ISBN: 0-662-34824-9 (0-662-34825-7). www.pmra-arla.gc.ca/english/pdf/pacr/pacr2003-09-e.pdf

14. United States Environmental Protection Agency. Interim tolerance reassessment eligibility decision and re-registration eligibility decision addenda for tetrachlorvinphos. Office of Prevention, Pesticides and Toxic Substances, 2002. 738-F-01-7508C.

15. MacNeil S [Sales and Marketing Manager, Engage Animal Health Corporation]. Personal communication, June 2006. Guelph, Ontario.

This Factsheet was authored by Dr. Bob Wright, Lead Veterinarian, Equine and Alternate Species, Ontario Ministry of Agriculture, Food and Rural Affairs, Fergus; Gregg Ogilvie, veterinary student at the Ontario Veterinary College (Class of 2008), University of Guelph, Guelph; and Shawna MacNeil, Sales and Marketing Manager, Engage Animal Health Corporation, Guelph.

Agricultural Information Contact Centre
1-877-424-1300
ag.info@omafra.gov.on.ca

www.omafra.gov.on.ca

POD
ISSN 1198-712X
Également disponible en français
(commande n° 06-072)